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KEPUTUSAN
DEKAN FAKULTAS TEKNIK UHAMKA
NOMOR 1203/A.01.04/2021

TENTANG

PENGANGKATAN PEMBIMBING SKRIPSI
PROGRAM STUDI TEKNIK INFORMATIKA STRATA SATU (S1)
FAKULTAS TEKNIK
UNIVERSITAS MUHAMMADIYAH PROF. DR. HAMKA
TAHUN AKADEMIK 2021/2022

Bismillahirrahmanirrahim,

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Menimbang :

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b. Bahwa untuk kelancaran dalam pelaksanaan pembimbing tersebut pada konsidern a diatas, perlu diangkat pembimbing skripsi ;
c. Bahwa untuk maksud konsidern diatas, perlu ditetapkan dengan keputusan Dekan Fakultas Teknik Universitas Muhammadiyah Prof. DR. HAMKA ;

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2. Peraturan pemerintah RI Nomor 17 tahun 2010 tanggal 28 Januari 2010, tentang pengelolaan dan penyelenggaraan perguruan tinggi.
3. Undang – Undang RI Nomor 12 tahun 2012 tanggal 10 Agustus 2012, tentang pendidikan tinggi.
4. Renstra Universitas Muhammadiyah Prof. DR. HAMKA. Tahun 2020-2024
5. Pedoman Pimpinan Pusat Muhammadiyah nomor 02/PEND/1.0/B/2012. Tanggal 24 April 2012, tentang Perguruan Tinggi Muhammadiyah.
6. Surat Keputusan Rektor Muhammadiyah Nomor 391/A.01.02/2021. Tanggal 13 Ramadhan 1443 H / 25 April 2021 M, tentang pengangkatan Dekan Fakultas Teknik Universitas Muhammadiyah Prof. DR. HAMKA.
7. Keputusan Dirjen Dikti Depdikbud RI. Nomor 138/DIKTI/Kep/1997. Tanggal 31 Mei 1997, tentang perubahan bentuk Institut Keguruan dan Ilmu Pendidikan (IKIP) Muhammadiyah Jakarta menjadi Universitas Muhammadiyah Prof. DR. HAMKA.
8. Statuta Univeritas Muhammadiyah Prof. DR. HAMKA tahun 2013.
9. Buku Panduan Akademik Universitas Muhammadiyah Prof. DR HAMKA Tahun Akademik 2021/2022

Memperhatikan	:	Surat Permohonan Ketua Program Studi Teknik Informatika nomor 1020/A.30.02/2021 tanggal 24 Agustus 2021 Tentang permohonan penerbitan Surat Keputusan Dekan mengenai pengangkatan Dosen Pembimbing Skripsi Program Studi Teknik Informatika Fakultas Teknik UHAMKA;

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Keempat	:	Keputusan ini berlaku sejak tanggal ditetapkan sampai 05 September 2022
Kelima	:	Apabila ada kesalahan dan atau kekeliruan dalam surat ini akan diperbaiki sebagaimana mestinya.

Ditetapkan di Jakarta
Pada tanggal, 28 Muharram 1443 H.
06 September 2021 M.

Dekan,

Dr. Dan Mugisidi, ST., M.Si.

Keputusan ini disampaikan kepada yth.
1. Rektor (sebagai laporan);
2. Wakil Dekan I;
3. Ketua Program Studi Teknik Informatika.

Universitas Muhammadiyah Prof. DR. HAMKA

LAMPIRAN SK DEKAN FAKULTAS TEKNIK (FT)
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TANGGAL : 28 Muharram 1443 H.
06 September 2021 M.

DOSEN PEMBIMBING SKRIPSI
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PROGRAM STUDI TEKNIK INFORMATIKA

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Jab. Akademik : Lektor

No	NIM	Nama Mahasiswa	Judul	Pembimbing
1	1803015206	Nur Amaliah	DETEKSI KELOMPOK ADIKSI DAN NON ADIKSI PADA PORNOGRAFI BERDASARKAN SINYAL LECTROENCEPHALOGRAPHY (EEG) MENGGUNAKAN FAST FOURIER TRANSFORM (FFT)	II
2	1803015146	Muhammad Aditya Pratama	ANALISIS TIME TO FIRST FIXATION PENGGUNA TERHADAP LABORATORIUM VIRTUAL MENGGUNAKAN EYE TRACKER	II

Jakarta 06 September 2021
Dekan

Dr. Dan Mugisidi, ST., M.Si

Journal of Health and Medical Sciences

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QEEG-based Brain Mapping of Internet Pornography Addicted Adolescents

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Abstract
The Indonesian government for many years has tried to protect the public from the dangers of pornography by blocking various sites. Although various efforts have been made to block access to pornography, a report from the Ministry of Women's Empowerment and Child Protection mentioned that 97% of Indonesian teens were exposed to pornography from the internet. In order to increase awareness, especially in the addiction phase, scientific evidences showing the bad effects of pornography addiction is needed. In this study, 15 teens addicted to internet pornography underwent brain mapping using electroencephalography (EEG) in a resting state for approximately 20 minutes. The data were processed using a quantitative EEG (QEEG) approach, especially Fast Fourrier Transform (FFT) by first removing all artifacts on the electroencephalogram during recording. The analysis focused on the delta wave in the forebrain, showing the dominance of the prefrontal cortex, which has implications for cognitive function decline, especially the braking system among these teens addicted to internet pornography. The decline in cognitive function causes teens to lose the ability to determine what is right and wrong or refrain from doing wrong. Based on the results, efforts to educate teens about the dangers of pornography addiction need to be further promoted.

Keywords: QEEG, Addiction, Pornography, Teens

1. Introduction

Advances in internet technology make it easier for various information to spread throughout the world, both positive content such as education or negative content such as pornography. In 2014, 25% of information searches

on various search engines turned out to be related to pornography (Kamaruddin *et al.,* 2019). The Indonesian government for many years has tried to protect the public from the dangers of pornography by blocking various sites (Kemkominfo, 2012). Although initially only limited to sites containing pornography specifically, now it is more widespread with the safe search mode on search engines, such as Google as a result of collaboration between the Ministry of Communication and Information and Internet Service Providers (Kemkominfo, 2018). Although various efforts have been made to block access to pornography, a report from the Ministry of Women's Empowerment and Child Protection mentioned that 97% of Indonesian teens were exposed to pornography from the internet (Kemenpppa, 2018). This is line with a study by Yayasan Kita and Buah Hati two years earlier (Prawiroharjo *et al.*, 2019). This fact is certainly worrying and there need to be prevention efforts based on scientific data through observation of brain activity.

Electroencephalography (EEG) is one of the gold standards for functional neuroimaging modalities to assess brain activity non-invasively (Wang *et al.*, 2018). Brain activity on the electroencephalogram can be interpreted in various ways, such as by direct observation for brain diseases such as epilepsy (Zhou et al., 2018) or by pre-processing the data with various techniques such as Naive Bayes (Lestari *et al.*, 2020), *random tree forest* (Lestari *et al.,* 2020), and so on. Until now, the effect of pornography on the brain, especially memory abilities or decreased function, is the same as those who experience trauma in the forebrain (Hou *et al.,* 2019). Several studies discussed pornography (Kamaruddin et al., 2019) but the scientific evidence is still not solid. Therefore, this study aimed to strengthen scientific data on internet pornography addiction. This study described qualitative EEG data on the brains of teens addicted to internet pornography.

2. Method

2.1. Subject

The data studied were secondary data from the Laboratory of Neuroscience Center Uhamka Database on 15 teens aged 14-16 years addicted to internet pornography recruited by Yayasan Kita and Buah Hati in 2019 based on the Pornography Addiction Test (Prawiroharjo et al., 2019). Exclusion criteria were left-handed, had a history of head trauma, had a history of brain disease, language disorders, psychiatric disorders, and neurological disorders.

2.2. EEG Data Record

The recording of brain signals used Cadwell EEG 16 electrodes (Fp1, Fp2, F3, F4, F7, F8, C3, C4, T3, T4, T5, T6, P3, P4, O1, and O2) and one reference electrode (CZ). The position of electrodes on the scalp follows the international 10 – 20 system (Siuly et al., 2016) as shown in Figure 1. The recording was carried out in a resting state for approximately 20 minutes where the subject was asked to open his eyes for two minutes followed by closing his eyes for two minutes, and so on alternately.

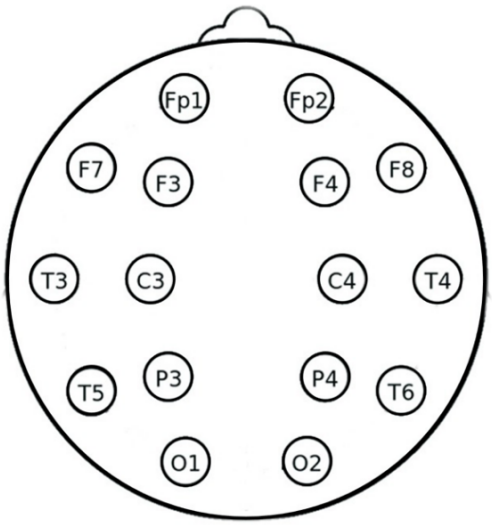

Figure 1: The position of EEG electrodes on the head based on the international system 10 - 20

2.3. Data Analysis

Data were analyzed in several stages:

1. From 20 minutes of brain activity recording data, only clean data in the form of data when closing the eyes for one minute was used as a result of filtering and rejecting noise and artifacts such as eye blinks and limb movements. This data cleaning was carried out manually and computationally with Neuroguide Deluxe 2.9.0 software with average reliability and retest value of 0.95 and 0.90.
2. After obtaining clean data, spectral analysis was carried out using Fast Fourier Transform (FFT) to calculate the absolute power value in five frequency bands namely delta (1–4Hz), theta (4–8Hz), alpha (8–12Hz), beta (12 –25Hz), and gamma (30–40Hz). The electrodes analyzed were electrodes representing the forebrain or frontal lobes in the form of FP1, FP2, F3, F4, F7, and F8.
3. In the final stage, statistical analysis was carried out with IBM SPSS Version 28 Windows software based on the mean of absolute power. The analysis was carried out to find out the wave dominance on pornography addicts.

3. Results

After conducting QEEG-based brain mapping on teens addicted to pornography in a resting state for two minutes, filtration was performed computationally and manually to obtain clean data on closed eyes for one minute. A high-pass filter of 70 Hz and a low-pass filter of 1Hz were used. In addition, in order to eliminate artifacts caused by electrical power, a sensitivity filter of 7mV/mm was used.

Furthermore, spectral analysis was carried out on the data focused on the forebrain region by the Fp1, Fp2, F3, F4, F7, and F8 electrodes as shown in Figure 2. Figure 3 shows FFT-based brain mapping visualization. The mapping was carried out in each frequency range of delta, theta, alpha, beta, and gamma.

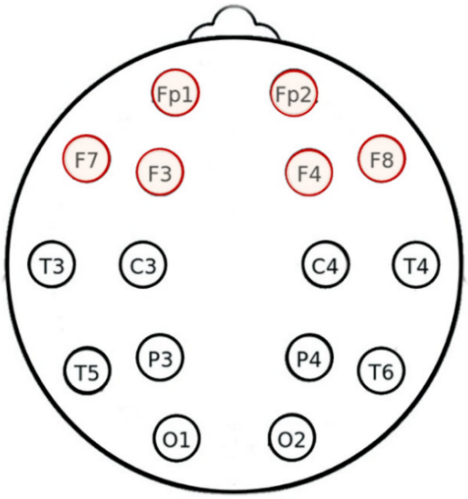

Figure 2: The EEG channel represents the forebrain

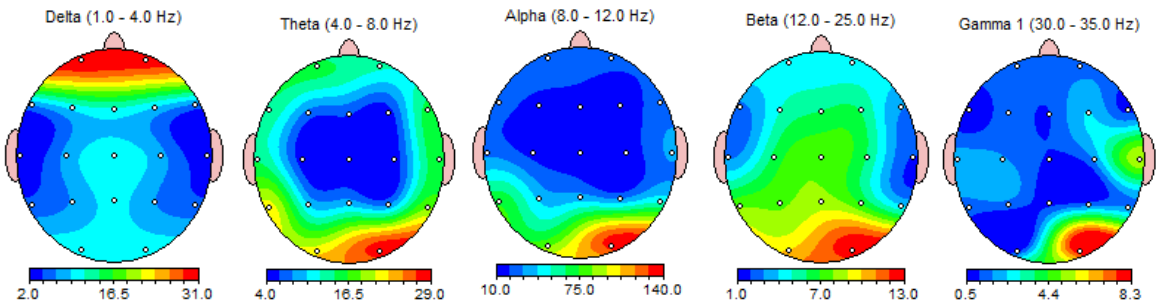

Figure 3: FFT shows the dominance of each wave in the brain

The analysis focused on the forebrain region also shows similar data as shown in Figure 4, and the average results in Table 1 show an increase in the dominance of the delta wave.

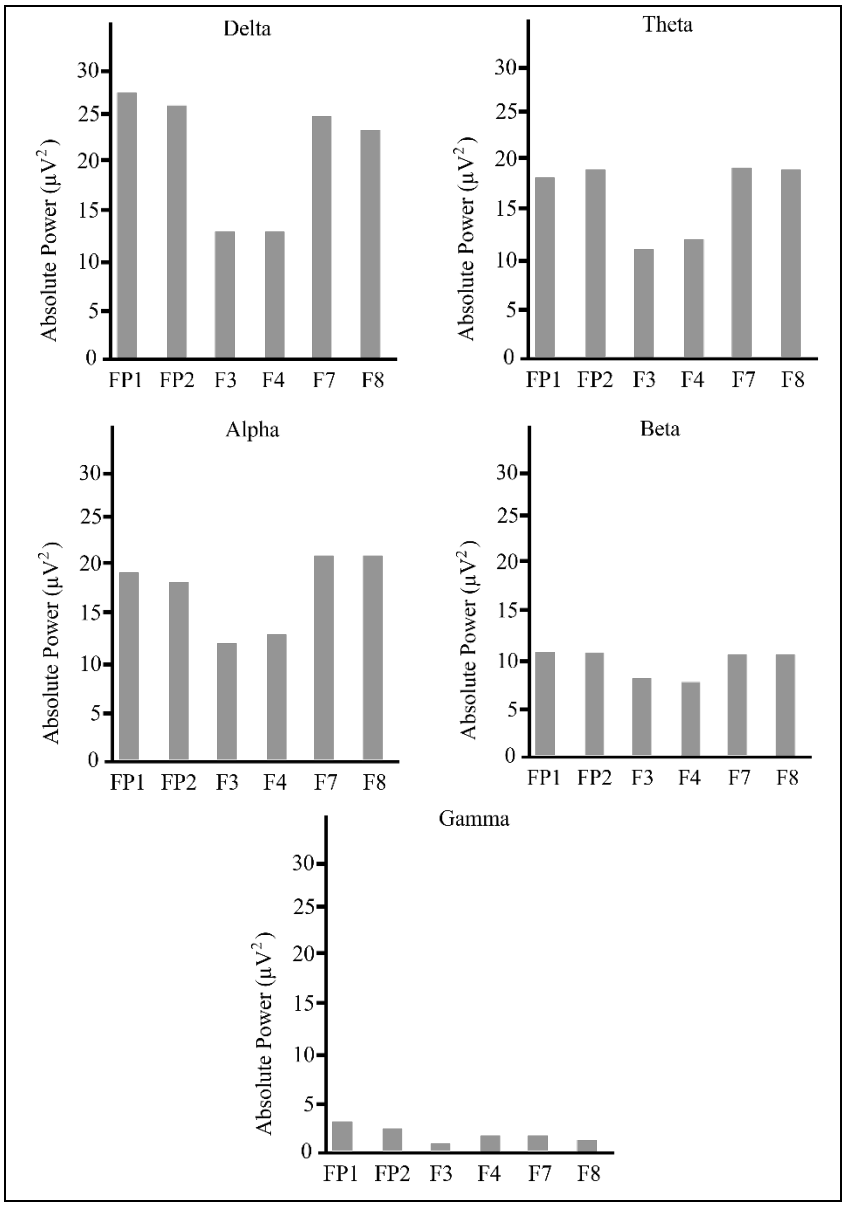

Figure 4: Average Value in Each Frequency Band

Table 1: Statistical Analysis Results of wave dominance in the forebrain

Value	Frequency Band				
	Delta	Theta	Alpha	Beta	Gamma
FP1	27.242	18.528	19.337	10.386	2.483
FP2	25.575	18.834	19.187	10.445	2.406
F3	13.131	11.773	12.088	7.771	1.264
F4	12.820	12.353	12.605	7.848	1.359
F7	24.927	19.403	20.785	10.696	1.794
F8	23.148	19.389	20.906	10.420	1.628

4. Discussion

In order to increase awareness, especially the addiction phase, a scientific evidence showing the bad effects of pornography addiction is needed. One of the worst affected human components due to pornography is the brain

(Love et al., 2015), because the brain is the place where all information is processed into the human body through sight, hearing, and so on. In addition, the brain plays an important role in the formation of behavior (Strumwasser, 1994).

To find out what will happen if someone experiences addiction, observation through interviews is a common practice. However, this method has two fundamental drawbacks from both the patient and examiner sides. For patients, it is possible to give a faking good answer as during a job interview (Levashina & Campion, 2007) to the examiner. Pornographic content is still taboo in our society. For the examiner, observation is not as objective as it is in reality because of the opportunity to experience the observer paradox (Wilner Warren, 1987) where the examiner has made a conclusion before starting the examination. These two things can cause errors in the data analysis process because of the large potential for bias. Therefore, it is necessary to think of a step to minimize the factors causing bias and increase objectivity. Thus, directly observing the brain is the best method.

In simple terms, to be able to see how the brain functions, invasive and non-invasive methods can be used. Invasive methods injure the human body, especially the head. However, although this method can provide the most accurate answer for assessing brain activity, it has a risk of infection or bleeding (Shah & Mittal, 2014). In addition, because invasive techniques to view the brain can only be performed by neurosurgeons, it is undeniable that this step cannot be the first choice. It is different with non-invasive methods where the body is not injured, so there is no risk of infection or bleeding, so all competent parties such as doctors, psychologists, or health workers can do it.

Brain activity recorded by EEG produces waves with various frequencies indicating real-time conditions in the brain. Delta waves in the relaxed forebrain are known to represent a decrease in brain activity (Sengoku & Takagi, 1998). Based on the observation, there was delta wave dominance in the prefrontal cortex of teens addicted to pornography. Previous studies found that pornography addiction shows dominance in the pre-frontal cortex (Kamaruddin et al., 2019). The process of addiction begins with the fulfillment of satisfaction. In the case of pornography addiction, pornography is captured by the five senses, especially the eyes as a triggering stimulus for the release of dopamine from the ventral tegmental area. The hormone will be delivered to the prefrontal cortex so that a sense of satisfaction appears. However, the sensation of satisfaction experienced by a person cannot last long (Malki *et al.,* 2021). In order to get back the sensation of satisfaction, teens looking for a stimulus from pornography. Similar situations can persist and can result in a dopamine rush. The impact of dopamine rush is hypofrontality syndrome where cognitive function decreases (Hilton & Watts, 2011).

5. Conclusion

Based on the results, there was delta wave dominance in the prefrontal cortex of teens addicted to pornography. Wave dominance is a characteristic of QEEG to determine the current condition of the brain. In addition, there is evidence of a decrease in the brain function of teens addicted to pornography, namely the dominance of the delta wave. Therefore, more massive educational efforts are needed to prevent the adverse effects of easy access to pornography on the internet.

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